Missile Defense Agency (MDA) Exhibit R-2 RDT&E Budget Item Justification	Date: February 2007
APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE: **0603886C Ballistic Missile Defense System Interceptors**

COST ($ in Thousands)	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
Total PE Cost	200,446	356,004	227,499	393,317	522,388	730,236	836,029	570,206
R213 Ballistic Missile Defense Interceptor Block 2014	189,964	336,796	0	0	0	0	0	0
0520 BMDS Interceptor	0	0	214,028	370,973	486,948	693,679	797,679	540,679
0602 Program-Wide Support	10,482	19,208	13,471	22,344	35,440	36,557	38,350	29,527

A. Mission Description and Budget Item Justification

A.1 System Element Description

The Ballistic Missile Defense System Interceptors mission is to develop, test, and field land and sea-based interceptor capabilities that will augment our capabilities against the current threat, keep pace with anticipated threats, and support our efforts to develop a layered defense. BMDS Interceptors is a strategically deployable, land-mobile, Kinetic Energy Interceptor element, consisting of a very fast, high acceleration, heavy lift interceptor, a land-mobile fire control and communications system, and a land-mobile launcher. Building upon BMDS sensor and Command Control, Battle Management, and Communication capabilities, the Missile Defense Agency will exploit the interceptor's mobility and early engagement capability, and distributed sensors to attack and defeat the adversary in new ways across the entire battle space.

MDA's Kinetic Energy Interceptor (KEI) is the centerpiece of the Interceptors element. The KEI program has three complementary objectives: (1) to develop a midcourse interceptor capable of replacing the current fixed Ground-based Interceptor (GBI) when the deployed GBIs become obsolete; (2) to develop this interceptor so that it could be strategically deployed as an additional midcourse capability with mobile land- or sea-based launchers; and (3) to assume the boost- and ascent-phase intercept mission within the BMDS if the Airborne Laser (ABL) fails to meet its performance objectives.

To pursue these objectives, MDA has modified the KEI program beginning in FY 2008 to focus on initially developing a single interceptor that can perform all three missions. The KEI interceptor would replace the GBIs in fixed sites and assume the midcourse coverage currently provided by the Ground-based Missile Defense (GMD) element. If deployed on mobile land or sea-based launchers, its speed and ability to launch from a wider range of geographic locations will enable it to expand BMDS midcourse coverage even further. Its speed and high acceleration also will permit early threat engagement in the boost/ascent regime where target intercepts and observations from the kill vehicle offer the greatest defensive payoff. A boost phase intercept destroys a missile before it can release its payload and any countermeasures; the additional capability to intercept in the early ascent phase enables single forward-based sites to deny and defend extremely large regions and fills coverage gaps that may arise due to geopolitical basing limitations, threat enhancements, and an adversary’s unanticipated or challenging launch tactics.

The interceptor design is compatible with land-fixed, land-mobile, and sea-mobile operations and features a high performance booster designed to carry multiple payload types. The program will also leverage and build upon BMDS sensor and Command Control, Battle Management, and Communication capabilities. The Kinetic Energy Interceptor design adheres to Agency quality, safety, environmental and mission assurance standards and contains several unique design features including: direct downlink of overhead infrared sensor data to a mobile weapon, advanced boost and early ascent phase target tracking and prediction algorithms, the ability to fuse data from multiple Overhead Non-Imaging Infra-Red and radar sensors, a fast burning rocket motor for short engagement timelines, a high velocity at burnout with heavy payloads, and a large divert capability that enables early weapon commits.

The Kinetic Energy Interceptors near term program emphasis is on component risk reduction and element engineering. The Agency's goal is to mitigate critical risk areas prior to making full budget commitments. The performance, manufacturing, and cost knowledge gained through knowledge points will drive investment decisions. The major knowledge points are: 1) real-time battle management and fire control tests with fully integrated BMDS sensors and Command, Control, Battle Management, and Communications capabilities to verify our quick response timeline and engagement sequences; and 2) an integrated booster flight test to demonstrate booster capabilities. Risk reduction tests for the integrated booster flight test include a series of wind tunnel tests and booster first and second stage static firings. In addition to Kinetic Energy Interceptors program execution performance, other BMDS investment priorities and threat evolution will dictate budget adjustments. At the knowledge-based decision points, the Missile Defense Agency Director will decide whether to continue the project as planned, terminate the effort, slow down the project, accelerate or reprioritize missions for the planned capabilities in pursuit of specific Test Bed or operational capability objectives.

To build quickly on the anticipated success of the FY 2008 booster flight test, the initial Kinetic Energy Interceptors capability will be from land-fixed launch sites. This approach leverages available BMDS infrastructure and facilities to begin intercept flight testing in Block 12. Element engineering for a mobile interceptor capability will be maintained at the level appropriate to complete development of a land- or sea-mobile capability and flight test program following the fielding of the land-fixed interceptor capability.

A.2 System Element Budget Justification and Contribution to the Ballistic Missile Defense System (BMDS)

The intelligence community's ability to predict exactly what the ballistic missile threat will be ten years from now is limited. The mobile Kinetic Energy Interceptors offer the warfighter and our Allies a responsive weapon capability to counter the rapid emergence of new adversaries, countermeasures, and tactics. When based in the United States or Allied country, the Kinetic Energy Interceptors battery can provide wide-area asymmetric defense coverage against any threat that flies outside the atmosphere. In a forward-based role, the warfighter can employ the Kinetic Energy Interceptor to cut off vulnerable attack corridors designed to exploit fixed site defenses. The strategic basing flexibility of the Kinetic Energy Interceptor is enhanced by its ability to engage targets with only space-based sensor support.

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The Kinetic Energy Interceptors program provides a high confidence path to a boost phase defense layer and a flexible, forward-based midcourse capability for the BMDS. Prior to fielding a mobile, multi-use interceptor capability, critical capabilities developed by the Kinetic Energy Interceptors program will be provided to enhance the capabilities of the BMDS. Near term, Kinetic Energy Interceptors early threat typing, and rapid state vector generation and threat trajectory prediction capabilities will be integrated into BMDS Command and Control, Battle Management and Communications Test Beds to improve the effectiveness of existing BMDS weapon and sensor elements. The capability to quickly type and track threats with only overhead sensors will enhance the BMDS' ability to counter the short timelines and unpredictable launch areas of asymmetric threats. A high performance, high mission assurance, and cost effective booster will enhance fixed-site BMDS capability following the Kinetic Energy Interceptors' FY 2008 booster flight knowledge point.

The Kinetic Energy Interceptors common booster is capable of carrying the Multiple Kill Vehicle and other advanced payloads needed to counter complex threats in midcourse. The Kinetic Energy Interceptor's mobility, fast acceleration, and heavy lift capacity provide the ability to deliver these payloads early in the midcourse timeline. The early Kinetic Energy Interceptor engagements (boost or early midcourse), in combination with later Ground Based Interceptor or Aegis Ballistic Missile Defense engagements, provide additional layers of protection and increase effectiveness against countermeasures for the BMDS. A top acquisition priority of the Kinetic Energy Interceptors is to improve interceptor quality and mission assurance, lower producibility risk, and reduce costs. The Kinetic Energy Interceptors contractor team is designing in product quality, affordability, core standards, and mission assurance at the outset of the program where the systems engineering investment yields the most leverage. Early program focus on manufacturing design and affordability will allow us to purchase high performance, multi-use, mobile interceptors at lower cost.

The Kinetic Energy Interceptor is a vital element of the layered BMDS. Kinetic Energy Interceptors unique mobility and performance combination brings to the BMDS the capability to engage threats in the early, forward portion of the BMDS battlespace. The Kinetic Energy Interceptors ability to execute its suite of gap-filling missions is enabled by a flexible fire control design that allows the interceptor to receive and react to fused data from a diverse suite of ballistic missile defense sensors (land, sea, and space). By adding a kinetic boost phase intercept layer and flexible ascent/midcourse capabilities to future BMDS Block capabilities, Kinetic Energy Interceptors enable the Missile Defense Agency to pace the threat, fill performance gaps, and increase BMDS effectiveness.

A.3 Major System Element Goals

- Successfully complete development and test events in support of FY 2008 knowledge-based decision point
  - Verify battle management and fire control capabilities (timelines and engagement sequences) through multiple real-time battle management and fire control tests with fully integrated BMDS sensor and Command, Control, Battle Management, and Communications capabilities
  - Conduct a series of wind tunnel and booster (first and second stage) static firing test events

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- Conduct an integrated booster flight test by 4th quarter FY 2008 with a booster design that is traceable to the tactical design
- Design the Block 2014 multi-use booster capability in close collaboration with the Agency Systems Engineering team
- Demonstrate land-fixed midcourse intercept capabilities in flight test by Block 2012 and complete the intercept test series by Block 2014
- Demonstrate mobile multi-use (boost, ascent, midcourse) intercept capabilities in flight test following the Agency's decision to complete development of the mobile interceptor capability

A.4 Major Events Schedule and Description

Major Event	Project	Timeframe	Description
Flight Test			
Interceptor			
Conduct Booster Flight #2 (FTK-02)	0520	2Q FY 2011	• First and second stage motors with mock payload
Conduct Partial Full Scale (PFS) Test 3 (FTK-03)	0520	1Q FY 2012	• Interceptor flight with mock payload
Kinetic Energy Interceptors Knowledge Point Events			
Booster Flight One Test (FTK-01)	0520	4Q FY 2008	• Verify booster performance
Other			
Kinetic Energy Interceptors Knowledge Point Events			
Conduct fused ONIR-Radar fire control tests	R213	3Q FY 2006	• In Pathfinder shelter (multiple engagement sequences)
Interceptor			
Stage 2 Rocket Motor Static Fire Two	0520	1Q FY 2008	• Validate performance under varied environments and loads
Stage 1 Rocket Motor Static Fire Three	0520	2Q FY 2008	• Validate performance under varied environments and loads
Stage 1 Rocket Motor Static Fire Four	0520	3Q FY 2008	• Validate performance under varied environments and loads
Stage 2 Rocket Motor Static Fire Three	0520	3Q FY 2008	• Validate performance under varied environments and loads
Stage 2 Rocket Motor Static Fire Four	0520	4Q FY 2008	• Validate performance under varied environments and loads
Stage 1 Rocket Motor Static Fire Five	0520	4Q FY 2009	• Validate performance under varied environments and loads
Stage 2 Rocket Motor Static Fire Five	0520	4Q FY 2009	• Validate performance under varied environments and loads
Stage 1 Rocket Motor Static Fire Six	0520	1Q FY 2010	• Validate performance under varied environments and loads
Stage 2 Rocket Motor Static Fire Six	0520	1Q FY 2010	• Validate performance under varied environments and loads
Static Fire Stage 2 Proof-of-Concept Rocket Motor	R213	2Q FY 2006	• Validate performance predictions with early full scale prototype test
Static Fire Stage 1 Proof-of-Concept Rocket Motor	R213	4Q FY 2006	• Validate performance predictions with early full scale prototype test
Complete booster wind tunnel tests	R213	2Q FY 2007	• Validate performance under varied environments and loads
Stage 1 Rocket Motor Static Fire One	R213	3Q FY 2007	• Validate performance under varied environments and loads
Stage 1 Rocket Motor Static Fire Two	R213	4Q FY 2007	• Validate performance under varied environments and loads
Stage 2 Rocket Motor Static Fire One	R213	4Q FY 2007	• Validate performance under varied environments and loads

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Element Engineering			
Conduct Control Test Vehicle Flight Test (FTK-04)	0520	1Q FY 2013	• Interceptor fight with inert Kill Vehicle
Element Engineering			
Weapon Element System Requirements Review	0520	1Q FY 2008	• Establish payload, land-fixed booster, and mobile element requirements
Conduct Capability Design Review - 0	0520	1Q FY 2010	• Establish design maturity prior to early test article procurement
Complete Element Integration Facility Phase I	0520	1Q FY 2011	
Conduct Land-Fixed Capability Design Review - 1	0520	2Q FY 2011	• Establish design maturity prior to procurement of developmental articles
Conduct Land-Fixed Capability Design Review - 2	0520	4Q FY 2012	• Establish design maturity prior to procurement of production articles
Support BMD System Concept Review	R213	3Q FY 2007	• Establish element contributions to BMDS capability for future Blocks
Government System Engineering & Program Management			
Support Boost/Ascent Reports to Congress	R213	2Q FY 2006 - 4Q FY 2006	
Sea Mobile Alternatives Assessment	R213	2Q FY 2006 - 4Q FY 2007	• Determine, jointly with the Navy, the most appropriate sea-mobile platform
Complete transition of KI office to Huntsville, AL	R213	4Q FY 2006	

B. Program Change Summary	FY 2006	FY 2007	FY 2008	FY 2009
Previous President's Budget (FY 2007 PB)	209,342	405,508	425,417	895,091
Current President's Budget (FY 2008 PB)	200,446	356,004	227,499	393,317
Total Adjustments	-8,896	-49,504	-197,918	-501,774
Congressional Specific Program Adjustments	0	-48,000	0	0
Congressional Undistributed Adjustments	0	-1,504	0	0
Reprogrammings	-5,153	0	0	0
SBIR/STTR Transfer	-3,743	0	0	0
Adjustments to Budget Years	0	0	-197,918	-501,774

FY06 decrease of $8.896 million includes SBIR/STTR transfer and MDA reprogrammings.

FY07 decrease of $49.504 million includes a congressional specific program reduction of $48.0 million and a portion of the MDA congressional undistributed reduction.

FY08 decrease of $197.918 million and FY09 decrease of $501.774 million reflects MDA programmatic changes to focus the BMDS Interceptors program on development of a fixed midcourse booster, with additional options.

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification	Date: February 2007
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COST ($ in Thousands)	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
R213 Ballistic Missile Defense Interceptor Block 2014	189,964	336,796	0	0	0	0	0	0
RDT&E Articles Qty	0	1	0	0	0	0	0	0

Note: The Ballistic Missile Defense Interceptors program is continued under project 0520 in FY08-13.

RDT&E Articles: FY07 - Booster Flight One - First and Second stage motors with mock payload (1).

A. Mission Description and Budget Item Justification

The Kinetic Energy Interceptors program is developing and testing fixed and mobile interceptor and fire control capabilities for the Agency's next generation kinetic interceptors capable of intercepting ballistic missiles in boost, early ascent, and midcourse. A single interceptor design is compatible with land-fixed, land-mobile, and sea-mobile basing, and the booster is designed to accommodate multiple payload types. Kinetic Energy Interceptors rely on distributed external sensors and flexible communication capabilities to deliver responsive layered defensive capabilities to the BMDS. The program execution focus through FY 2008 is the completion of booster and fire control knowledge point events that conclusively demonstrate the programs' readiness to proceed to intercept flight testing and Ballistic Defense System Test Bed integration. The knowledge point decision is supported by a campaign of real-time battle management and fire control tests in FY 2006 and an integrated booster flight test in FY 2008. Risk reduction events leading to the booster flight include ten static rocket motor firings (five Stage 1 and five Stage 2) and wind tunnel testing of the interceptor air frame. The knowledge point development and testing, along with parallel objective element design, is enabled by a disciplined systems engineering effort across all the integrated product teams. We plan to transition to land-fixed site midcourse intercept flight testing in Block 2012.

The Kinetic Energy Interceptors development and test effort is comprised of interceptor, fire control and communications, launcher, integration and test, element engineering, government systems integration and test work packages, and government systems engineering and program management.

B. Accomplishments/Planned Program

	FY 2006	FY 2007	FY 2008	FY 2009
Interceptor	94,136	177,371	0	0
RDT&E Articles (Quantity)	0	1	0	0

The FY 2007 interceptor component development and test activities build on the successful FY 2006 Stage 1 and 2 Proof of Concept static motor firings and focus on the essential efforts required to fly a tactically representative booster in FY 2008. These activities include extensive ground testing and integration of key components (rocket motors, thrust vector control units, avionics and software, etc.) necessary to demonstrate the booster capability with a high probability of mission success. The knowledge gained from the FY 2008 booster flight will be used to engineer a

multi-use interceptor that is producible, reliable, and affordable. This capability will be demonstrated through an increasingly complex set of ground and flight tests ranging from static motor firings to fully integrated intercept tests.

FY06 Accomplishments:
- Conducted the Stage 2 Proof of Concept rocket motor static firing which verified Stage 2 performance predictions
- Conducted Booster Flight One test Preliminary Design Review to baseline Booster Flight One design and approve long lead hardware procurement
- Proof tested an inert Stage 1 motor case to validate the pressure capability of the composite case
- Conducted Stage 1 Proof of Concept rocket motor static firing which verified Stage 1 performance predictions

FY07 Planned Program:
RDT&E Articles: Booster Flight One - First and Second stage motors with mock payload (1)
- Initiate procurement of long-lead hardware for the FY 2008 Booster Flight One (BMDS event designation, FTK-01) test article
- Complete booster hypersonic wind tunnel test series
- Conduct Critical Design Review to define the detailed configuration of the Booster Flight One test article
- Conduct two Stage 1 and one Stage 2 rocket motor static firings to subject the motors to increasingly severe environments and loads
- Perform integrated ground testing of the Booster Flight One (FTK-01) avionics and associated software
- Execute ground testing of the Stage 1 to Stage 2 stage separation hardware to validate separation performance analysis
- Burst test a Stage 2 rocket motor case to determine the ultimate pressure capability of the Booster Flight One (FTK-01) motor configuration
- Conduct bench testing of thrust vector control actuators to validate performance predictions
- Begin fabrication and test of Booster Flight One (FTK-01) hardware
- Provide Interceptor component input to the BMD System Concept Review

	FY 2006	FY 2007	FY 2008	FY 2009
Fire Control and Communications	20,406	31,955	0	0
RDT&E Articles (Quantity)	0	0	0	0

The fire control and communications component development and test activities include execution of near-term activities to reduce risk associated with BMDS interface definition, fire control algorithm performance and robustness, internal and external communication latencies, and false alarm

rate. Risk reduction work includes building a prototype Kinetic Energy Interceptor Fire Control shelter and testing data fusion and decision software with live overhead infrared and radar sensor data.

FY06 Accomplishments:
- Demonstrated forward-based radar interface and fusion of radar and infrared data in the Pathfinder shelter (fire control test with playback of live event data)
- Demonstrated ability to receive and process national sensor data in the field during live events to support formation of accurate missile tracks in the boost phase
- Completed in-flight data link compatibility analysis with the Navy Cooperative Engagement Capability System to ensure non-interference operations on land and sea to prepare for live testing
- Built and tested prototype antenna panels to characterize in-flight communications system performance
- Updated interface requirements to the BMDS Command and Control, Battle Management and Communications element to ensure seamless element integration into the BMDS

FY07 Planned Program:
- Conduct initial compatibility testing with prototype transmit panel to demonstrate compatibility with Navy Cooperative Engagement Capability system
- Test in-flight communications system transmit panel in lab to validate transmitter design
- Define the BMDS interfaces to provide AN/TPY-2 data to the Kinetic Energy Interceptors Fire Control and Communications pathfinder shelter
- Provide Fire Control and Communications component input to the BMD System Concept Review.

	FY 2006	FY 2007	FY 2008	FY 2009
Launcher	7,367	17,990	0	0
RDT&E Articles (Quantity)	0	0	0	0

The near term land-mobile launcher development and test activities include launcher requirements definition, top-level design, and interface definition to establish Kinetic Energy Interceptor System requirements.

FY06 Accomplishments:
- Completed land-mobile launcher concept design trades

- Developed draft launcher prime item development specification to establish the baseline performance requirements for the launcher hardware and software
- Defined and documented information exchange requirements between the launcher component, fire control and communications component, and all-up-round to assure interoperability

FY07 Planned Program:
- Complete launcher concept design update trades and functional requirements analyses
- Establish launcher interface requirements to other Kinetic Energy Interceptors components (all-up round and fire control)
- Provide Launcher component input to the BMD System Concept Review.

	FY 2006	FY 2007	FY 2008	FY 2009
Integration and Test	5,686	12,776	0	0
RDT&E Articles (Quantity)	0	0	0	0

The Kinetic Energy Interceptor integration and test responsibilities include developmental master test planning, coordination of test range interfaces, integration facility planning and design, integration facility construction, environmental analyses and documentation, and manufacturability planning.

FY06 Accomplishments:
- Provided flight safety data package to Vandenberg Air Force Base for the Booster Flight One (FTK-01) test
- Recommended sites for System Integration Facility and Element Integration Facility and initiated environmental analysis
- Initiated requirements analysis and design of System Integration Lab, System Integration Facility, and Element Integration Facility
- Published Developmental Master Test Plan

FY07 Planned Program:
- Perform detailed range resource and safety planning and coordination for Booster Flight One (FTK-01)
- Draft Facility Requirements Documents for Kinetic Energy Interceptors
- Initiate long-lead range resource and safety and environmental planning and coordination for flight tests that follow the FY 2008 knowledge point: Booster Flight Two (FTK-02), Partial Full Scale (FTK-03), and Control Test Vehicle (FTK-04)

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification	Date: February 2007
APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE: **0603886C Ballistic Missile Defense System Interceptors**

	FY 2006	FY 2007	FY 2008	FY 2009
Element Engineering	46,511	60,702	0	0
RDT&E Articles (Quantity)	0	0	0	0

The Kinetic Energy Interceptors element engineering activities include all prime contractor program management operations, capability and interface specification development and flow-down, operations concept definition, element-level design trades, engagement sequence definition, element analyses and performance assessments, target of opportunity analysis to reduce key program risks such as tracking and discrimination, configuration control and change management, manufacturing, quality, affordability and risk-reduction, simulation development, and collaborative engineering planning and management with the Kinetic Energy Interceptor integrated product teams and key Agency organizations (Systems Engineering, Sensors, and Command, Control, Battle Management and Communications).

FY06 Accomplishments:

- Completed concept baseline update review to capture multi-use (boost, ascent, midcourse) design updates
- Updated Element Capability and Interface specifications
- Generated draft top level (A-level) design specification and flowed-down to component integrated product teams
- Completed boost/ascent/midcourse performance assessment #2
- Delivered initial Kinetic Energy Interceptors Simulation version 1.5
- Analyzed relevant Targets of Opportunity test data and incorporate results into Kinetic Energy Interceptors simulations and engineering notebooks

FY07 Planned Program:

- Provide analysis across performance trade spaces for the BMD System Concept Review to establish specific BMDS performance gaps to be filled by Kinetic Energy Interceptors
- Complete Kinetic Energy Interceptors Test Bed Description Document, System Specification, and Element Capability and Interface Specifications
- Update draft element top level (A-level) design specification and flow down to component integrated product teams
- Update simulations to support the 2008 Nimble Titan Wargame
- Deliver Kinetic Energy Interceptors Simulation version 2.0
- Analyze Targets of Opportunity test data and incorporate results into Kinetic Energy Interceptors simulations and engineering notebooks

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	FY 2006	FY 2007	FY 2008	FY 2009
Government Systems Integration & Test	657	2,059	0	0
RDT&E Articles (Quantity)	0	0	0	0

The Government Systems Integration and Test effort includes test range planning and environmental compliance.

FY06 Accomplishments:

- Conducted lethality simulations of various boost/ascent engagements between the Kinetic Energy Interceptors kill vehicle and the second of four long range threat missiles
- Obtained approval for Record of Environmental Consideration for four Stage 1 rocket motor static firings at ATK in Promontory, Utah

FY07 Planned Program:

- Establish Host-Tenant Agreement with Vandenberg Air Force Base for Booster Flight One test (FTK-01), Booster Flight Two test (FTK-02), and Partial Full Scale test (FTK-03)
- Obtain approval for Record of Environmental Consideration for four Stage 2 rocket motor static firings at Elkton, Maryland
- Initiate a program Environmental Assessment

	FY 2006	FY 2007	FY 2008	FY 2009
Government Systems Engineering and Program Management	15,201	33,943	0	0
RDT&E Articles (Quantity)	0	0	0	0

The Government Systems Engineering and Program Management effort includes the program office, service laboratory and intelligence agency generation of threat data packages for the Kinetic Energy Interceptors development and test contract, BMDS interface definition and implementation support outside the Kinetic Energy Interceptor program office, participation in ballistic missile defense wargames, off-contract technology risk reduction efforts, and off-contract special studies such as congressional reports and the sea-based alternatives assessment.

The Kinetic Energy Interceptor is designed as a multi-use land/sea all-up round. The interceptor dimensions and safety features such as a gas eject launch make it compatible with surface combatants, submarines, and large non-combatant ships. In FY 2005, Kinetic Energy Interceptors completed a joint study with the Navy on the concept of operations and feasibility of the sea-mobile multi-use mission. In FY 2006 and FY 2007 a highly detailed joint study will be completed to produce a comprehensive alternatives assessment of viable sea-mobile platforms. The study group will recommend a platform strategy to enable platform-specific planning, system engineering, and risk reduction that will facilitate a smooth start on future sea-mobile capability development and test after the Kinetic Energy Interceptors FY 2008 booster flight and decision point.

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification	Date: February 2007
APPROPRIATION/BUDGET ACTIVITY: RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)	R-1 NOMENCLATURE: 0603886C Ballistic Missile Defense System Interceptors

FY06 Accomplishments:

- Completed transition of program office operations from Arlington, Virginia to Huntsville, Alabama
- Initiated, jointly with the Navy, a Kinetic Energy Interceptor Sea-Based Alternatives Assessment to determine the most appropriate platform for Kinetic Energy Interceptors sea-mobile platform. Completed surface ship integration and submarine communication and timeline study tasks.
- Updated boost, ascent, and midcourse threat data package deliverables to prime contractor
- Supported delivery of Reports to Congress on BMDS boost and ascent phase capabilities
- Participated in Nimble Titan Wargame

FY07 Planned Program:

- Participate in the BMD System Concept Review to establish specific BMDS performance gaps to be filled by Kinetic Energy Interceptors
- Complete, jointly with the Navy, a Kinetic Energy Interceptor Sea-Mobile Platform Alternatives Assessment to determine the most appropriate Kinetic Energy Interceptor sea-mobile platform
- Update Kinetic Energy Interceptors sections of BMDS Test Bed Description Document and System Specification in collaboration with MDA Systems Engineering team and based on the results of the BMD System Concept Review
- Update boost, ascent, and midcourse threat data package deliverables to Kinetic Energy Interceptors prime contractor to support the BMD System Concept Review and Weapon Element System Requirements Review

C. Other Program Funding Summary

	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	Total Cost
PE 0603175C Ballistic Missile Defense Technology	147,270	193,307	118,569	109,540	116,014	121,008	127,917	131,291	1,064,916
PE 0603881C Ballistic Missile Defense Terminal Defense Segment	1,120,879	1,092,076	962,585	1,004,282	924,101	851,213	678,694	501,147	7,134,977
PE 0603882C Ballistic Missile Defense Midcourse Defense Segment	2,391,246	3,043,058	2,520,064	2,359,665	2,179,602	1,699,963	1,153,082	1,183,003	16,529,683
PE 0603883C Ballistic Missile Defense Boost Defense Segment	455,572	628,958	548,759	432,432	448,375	678,913	829,683	1,026,239	5,048,931
PE 0603884C Ballistic Missile Defense Sensors	284,297	514,129	778,163	984,963	939,417	791,701	723,843	603,585	5,620,098
PE 0603888C Ballistic Missile Defense Test and Targets	610,619	601,782	586,150	628,364	662,984	681,511	696,037	705,210	5,172,657
PE 0603889C Ballistic Missile Defense Products	387,402	0	0	0	0	0	0	0	387,402
PE 0603890C Ballistic Missile Defense System Core	409,993	429,420	482,016	511,147	558,746	579,571	579,316	588,481	4,138,690

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification	Date: February 2007
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	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	Total Cost
PE 0603891C Special Programs - MDA	271,021	353,031	323,250	305,409	369,073	526,966	789,017	792,271	3,730,038
PE 0603892C Ballistic Missile Defense Aegis	893,040	1,122,669	1,059,103	1,129,425	1,221,650	1,067,587	1,054,753	1,089,078	8,637,305
PE 0603893C Space Tracking & Surveillance System	220,048	322,220	331,525	347,811	412,623	501,197	778,067	981,424	3,894,915
PE 0603894C Multiple Kill Vehicle	48,370	144,362	271,151	352,741	461,179	618,263	673,477	842,905	3,412,448
PE 0603895C BMD System Space Program	0	0	27,666	35,093	46,849	56,183	133,617	157,117	456,525
PE 0603896C BMD C2BMC	0	246,852	258,913	294,627	300,847	282,615	267,275	269,420	1,920,549
PE 0603897C BMD Hercules	0	49,674	53,658	54,264	54,405	55,142	53,355	54,198	374,696
PE 0603898C BMD Joint Warfighter Support	0	54,935	48,787	50,428	54,086	56,603	58,890	60,206	383,935
PE 0603904C BMD Joint National Integration Center (JNIC)	0	110,629	104,012	106,985	111,542	111,947	113,592	115,287	773,994
PE 0603905C BMD Concurrent Test and Operations	0	23,159	0	0	0	0	0	0	23,159
PE 0603906C Regarding Trench	0	0	2,000	3,000	5,000	5,000	9,000	9,000	33,000
PE 0605502C Small Business Innovative Research - MDA	133,105	0	0	0	0	0	0	0	133,105
PE 0901585C Pentagon Reservation	14,874	15,527	6,058	6,376	4,490	4,725	4,801	4,877	61,728
PE 0901598C Management Headquarters - MDA	98,609	87,059	85,906	86,453	70,355	69,855	69,855	69,855	637,947

D. Acquisition Strategy

The Kinetic Energy Interceptors development and test acquisition strategy focuses on developing gap-filling, multi-use kinetic energy capabilities for land-fixed and strategically deployable land-mobile and sea-mobile platforms. The Kinetic Energy Interceptor element is being developed under a single prime contractor selected competitively at the start of development. As of this budget, the revised acquisition strategy for Kinetic Energy Interceptors is for payloads to be budgeted and developed under other BMDS elements that deliver each payload for integration into the Kinetic Energy Interceptors element. Also, initial testing and deployment of the Kinetic Energy Interceptor booster will now be from a land-fixed site to leverage available BMDS infrastructure. The FY 2005 through FY 2008 development verification test results mitigate critical program risks, and provide the agency very detailed design, performance, cost, and programmatic knowledge to support the FY 2008 knowledge point decision. This strategy also implements early proofing of critical manufacturing processes as an integral part of the design process. The payoff for these up front program investments in systems engineering, full scale risk reduction testing, and manufacturing process development is reduced redesign and retest, fewer test failures as well as lowered manufacturing cost. The strategy will utilize Engineering and Manufacturing Readiness Levels and Software Readiness Levels as maturity and risk indicators for proceeding forward with detailed design, building flight hardware and having a production off-ramp.

Missile Defense Agency (MDA) Exhibit R-3 RDT&E Project Cost Analysis	Date: February 2007
APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE: **0603886C Ballistic Missile Defense System Interceptors**

I. Product Development Cost ($ in Thousands)

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2007 Cost	FY 2007 Award/ Oblg Date	FY 2008 Cost	FY 2008 Award/ Oblg Date	FY 2009 Cost	FY 2009 Award/ Oblg Date	Total Cost
Interceptor										
Interceptor	C/CPAF	Raytheon, Tucson, AZ	106,138	177,371	1Q	0	N/A	0	N/A	283,509
Fire Control and Communications										
Fire Control and Communications	C/CPAF	Northrop Grumman, Huntsville, AL/Boulder, CO	23,798	31,955	1Q	0	N/A	0	N/A	55,753
Launcher										
Launcher	C/CPAF	Northrop Grumman, Sunnyvale, CA	7,377	17,990	1Q	0	N/A	0	N/A	25,367
Integration and Test										
Integration & Test	C/CPAF	Northrop Grumman, El Segundo, CA	4,760	12,776	1Q	0	N/A	0	N/A	17,536
Element Engineering										
Contractor Element Engineering	C/CPAF	Northrop Grumman, Fairfax, VA	40,908	60,702	2Q	0	N/A	0	N/A	101,610
Government Systems Engineering and Program Management										
Subtotal Product Development			182,981	300,794		0		0		483,775

Remarks

Missile Defense Agency (MDA) Exhibit R-3 RDT&E Project Cost Analysis	Date: February 2007
APPROPRIATION/BUDGET ACTIVITY: RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)	R-1 NOMENCLATURE: 0603886C Ballistic Missile Defense System Interceptors

II. Support Costs Cost ($ in Thousands)

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2007 Cost	FY 2007 Award/ Oblg Date	FY 2008 Cost	FY 2008 Award/ Oblg Date	FY 2009 Cost	FY 2009 Award/ Oblg Date	Total Cost
Government Systems Engineering and Program Management										
Civilian Salaries		Missile Defense Agency, Huntsville, AL	1,072	1,368	1Q	0	N/A	0	N/A	2,440
Government Travel		Missile Defense Agency, Huntsville, AL	934	695	2Q	0	N/A	0	N/A	1,629
SETA	C/FFP	MEI, Huntsville, AL	7,644	8,346	1Q	0	N/A	0	N/A	15,990
KEI BMDS Interfaces	C/CPAF	Northrop Grumman, Fairfax, VA	5,395	18,250	1Q	0	N/A	0	N/A	23,645
Sea Based	MIPR	NSWC, Dahlgren, VA / NSWC, Carderock, MD/ NAVSEA, Washington, DC	3,500	5,198	2Q	0	N/A	0	N/A	8,698
FFRDC	MIPR	MITRE, Corp, McLean, VA	0	86	2Q	0	N/A	0	N/A	86
Subtotal Support Costs			18,545	33,943		0		0		52,488

Remarks

Missile Defense Agency (MDA) Exhibit R-3 RDT&E Project Cost Analysis	Date: February 2007
APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE: **0603886C Ballistic Missile Defense System Interceptors**

III. Test and Evaluation Cost ($ in Thousands)

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2007 Cost	FY 2007 Award/ Oblg Date	FY 2008 Cost	FY 2008 Award/ Oblg Date	FY 2009 Cost	FY 2009 Award/ Oblg Date	Total Cost
Government Systems Integration & Test										
NEPA	MIPR	SMDC, Huntsville, AL	25	2,059	2Q	0	N/A	0	N/A	2,084
Subtotal Test and Evaluation			25	2,059		0		0		2,084

Remarks

IV. Management Services Cost ($ in Thousands)

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2007 Cost	FY 2007 Award/ Oblg Date	FY 2008 Cost	FY 2008 Award/ Oblg Date	FY 2009 Cost	FY 2009 Award/ Oblg Date	Total Cost
Subtotal Management Services										

Remarks

Project Total Cost			201,551	336,796		0		0		538,347

Remarks

The Prime Contractor has the responsibility to balance resources across the KEI program and allocate funding according to program progress. This may require the Prime Contractor to reallocate funding, which would change the estimates provided in this R-3 document.

Missile Defense Agency (MDA) Exhibit R-4 Schedule Profile

Date
February 2007

APPROPRIATION/BUDGET ACTIVITY
RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)

R-1 NOMENCLATURE
0603886C Ballistic Missile Defense System Interceptors

Fiscal Year	2006				2007				2008				2009				2010				2011				2012				2013			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Kinetic Energy Interceptors Knowledge Point Events																																
Conduct fused ONIR-Radar fire control tests			▲																													
Element Engineering																																
Complete multi-use performance assessment #2				▲																												
Concept design baseline update				▲																												
Support BMD System Concept Review							△																									
Interceptor																																
Static Fire Stage 2 Proof-of-Concept Rocket Motor		▲																														
Static Fire Stage 1 Proof-of-Concept Rocket Motor				▲																												
Complete booster wind tunnel tests						△																										
Booster Flight One (FTK-01) Critical Design Review							△																									
Stage 1 Rocket Motor Static Fire One							△																									
Stage 1 Rocket Motor Static Fire Two								△																								
Stage 2 Rocket Motor Static Fire One								△																								

Legend

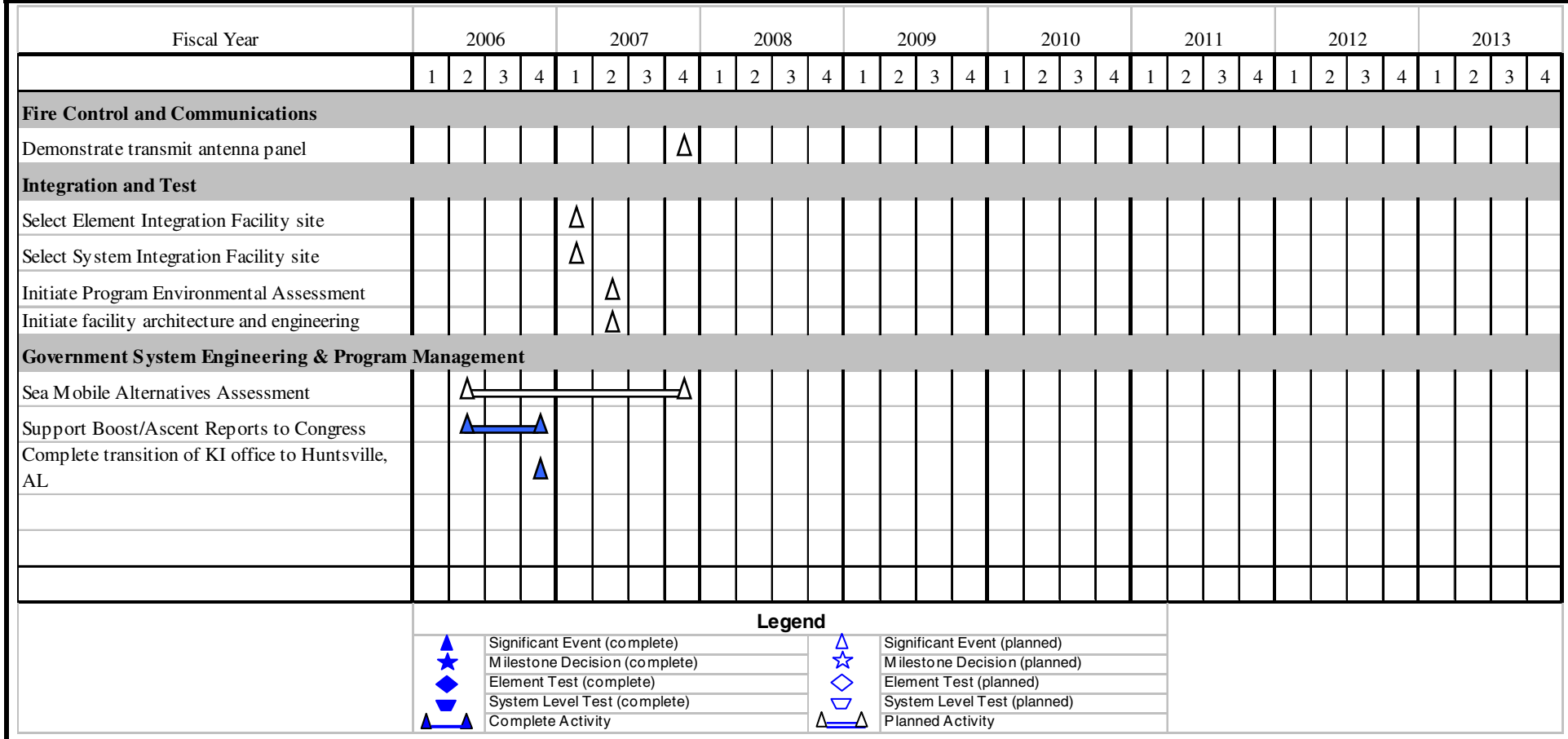
▲	Significant Event (complete)	△	Significant Event (planned)
★	Milestone Decision (complete)	☆	Milestone Decision (planned)
◆	Element Test (complete)	◇	Element Test (planned)
▼	System Level Test (complete)	▽	System Level Test (planned)
▲▬▲	Complete Activity	△▬△	Planned Activity

Missile Defense Agency (MDA) Exhibit R-4 Schedule Profile

Date: **February 2007**

APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**

R-1 NOMENCLATURE: **0603886C Ballistic Missile Defense System Interceptors**



Missile Defense Agency (MDA) Exhibit R-4A Schedule Detail	Date: February 2007
APPROPRIATION/BUDGET ACTIVITY: RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)	R-1 NOMENCLATURE: 0603886C Ballistic Missile Defense System Interceptors

Schedule Profile	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
Kinetic Energy Interceptors Knowledge Point Events								
Conduct fused ONIR-Radar fire control tests	3Q							
Element Engineering								
Target of Opportunity Data Analysis	3Q	3Q						
Deliver KEI SIM Version 2.0	3Q							
Update element capability interface specifications	3Q							
Complete multi-use performance assessment #2	4Q							
Concept design baseline update	4Q							
Support BMD System Concept Review		3Q						
Interceptor								
Static Fire Stage 2 Proof-of-Concept Rocket Motor	2Q							
Static Fire Stage 1 Proof-of-Concept Rocket Motor	4Q							
Complete booster wind tunnel tests		2Q						
Booster Flight One (FTK-01) Critical Design Review		3Q						
Stage 1 Rocket Motor Static Fire One		3Q						
Stage 1 Rocket Motor Static Fire Two		4Q						
Stage 2 Rocket Motor Static Fire One		4Q						
Fire Control and Communications								
Conduct Algorithm/Timeline Demonstrations	3Q							
Demonstrate CKEI data fusion in pathfinder	3Q							
Demonstrate Radar-ONIR Fusion in pathfinder	3Q							
Demonstrate transmit antenna panel		4Q						
Integration and Test								
Publish/Update Developmental Master Test Plan	3Q	4Q						
Publish/Update Target Requirements Documentation	3Q							
Publish/Update VV&A Plan	3Q	3Q						
Select Element Integration Facility site		1Q						
Select System Integration Facility site		1Q						
Initiate Program Environmental Assessment		2Q						
Initiate facility architecture and engineering		2Q						

Missile Defense Agency (MDA) Exhibit R-4A Schedule Detail	Date: February 2007
APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE: **0603886C Ballistic Missile Defense System Interceptors**

Schedule Profile	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
Government Integration and Test								
Participate in Nimble Titan Wargame Exercise	3Q							
Government System Engineering & Program Management								
Sea Mobile Alternatives Assessment	2Q-4Q	1Q-4Q						
Support Boost/Ascent Reports to Congress	2Q-4Q							
Input to BMDS Master Integration Plan	3Q							
Complete transition of KI office to Huntsville, AL	4Q							
Deliver Boost/Ascent/Midcourse threat data package		2Q						
Generate KEI sections of TBDD & TBSS with MDA/SE		3Q						
Support BMD SCR		3Q						
Update test bed description document		3Q						

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification	Date: February 2007
APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE: **0603886C Ballistic Missile Defense System Interceptors**

COST ($ in Thousands)	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
0520 BMDS Interceptor	0	0	214,028	370,973	486,948	693,679	797,679	540,679
RDT&E Articles Qty	0	0	0	2	1	4	0	0

Note: This project continues the Ballistic Missile Defense System Interceptors program executed under project R213 in FY06 and FY07.

Project R213 sub-sections for Launcher, Fire Control & Communications, and Integration & Test have been combined into the Project 0520 sub-sections for Element Engineering due to the near-term focus on booster development and integration into the BMDS land-fixed site infrastructure. Launcher, Fire Control & Communications, and Integration & Test work required to support the development path to a mobile interceptor capability are contained within the Element Engineering sub-section. Also, the sub-section for Government Integration and Test has been folded into the Government Systems Engineering and Program Management sub-section. Government Integration and Test work to support development flight testing and integrated (intercept) flight testing is contained within the Government Systems Engineering and Program Management sub-section.

RDT&E Articles: FY09 - Booster Flight Two - First and Second stage motors with mock payload (1); Partial Full Scale - Interceptor flight with mock payload (1). FY10 - Control Test Vehicle - Interceptor flight with inert Kill Vehicle (inert Liquid Divert and Attitude Control System) (1). FY11 - Integrated Flight Test 1 - First Interceptor flight against target (1); Spare Interceptor (1); Integrated Flight Test 2 (1); Integrated Flight Test 3 (1).

A. Mission Description and Budget Item Justification

The Kinetic Energy Interceptors program is developing and testing fixed and mobile interceptor and fire control capabilities for the Agency's next generation kinetic interceptors capable of intercepting ballistic missiles in the boost, early ascent, and midcourse. A single interceptor design is compatible with land-fixed, land-mobile, and sea-mobile basing, and the booster is designed to accommodate multiple payload types. The Kinetic Energy Interceptor relies on distributed external sensors and flexible communication capabilities to deliver responsive layered defensive capabilities to the Ballistic Missile Defense System. The program execution focus through FY 2008 is the completion of booster and fire control knowledge point events that conclusively demonstrate the programs' readiness to proceed to intercept flight testing and Ballistic Defense System Test Bed integration. The knowledge point decision is supported by a campaign of real-time battle management and fire control tests in FY 2006 and an integrated booster flight test in FY 2008. Risk reduction events leading to the booster flight include ten static rocket motor firings (five Stage 1 and five Stage 2) and wind tunnel testing of the interceptor air frame. The knowledge point development and testing, along with parallel objective element design, is enabled by a disciplined systems engineering effort across all the integrated product teams. We plan to transition to land-fixed site midcourse intercept flight testing in Block 2012 if the FY 2008 knowledge point events are successful.

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification	Date: February 2007
APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE: **0603886C Ballistic Missile Defense System Interceptors**

The Kinetic Energy Interceptors development and test effort is comprised of interceptor development, element engineering, and government system engineering and program management work packages. Ongoing work to maintain the path to a mobile interceptor capability and integration and test work to support booster development flight tests are included in Element Engineering.

B. Accomplishments/Planned Program

	FY 2006	FY 2007	FY 2008	FY 2009
Interceptor	0	0	130,970	252,836
RDT&E Articles (Quantity)	0	0	0	2

The FY 2008 interceptor component development and test activities are heavily focused on the flight test of a tactically representative booster in the fourth quarter of FY 2008. These activities include extensive ground testing and integration of key components (rocket motors, thrust vector control units, avionics and software, etc.) necessary to demonstrate the booster capability with a high probability of mission success. The knowledge gained from a successful booster flight will be directly leveraged to engineer a multi-use interceptor that is both producible and reliable. This capability will be demonstrated through an increasingly complex set of ground and flight tests ranging from static motor firings to fully integrated intercept tests.

FY08 Planned Program:

- Conduct two Stage 1 Static Rocket Motor Firings to validate rocket motor performance in increasingly demanding environments
- Conduct three Stage 2 Static Rocket Motor Firings to validate rocket motor performance in increasingly demanding environments
- Complete Draft Booster Prime Item Development Specification
- Conduct Interceptor component System Requirements Review
- Perform detailed range resource and safety planning and coordination for Booster Flight One (FTK-01)
- Conduct Booster Flight One (FTK-01) test to validate and demonstrate the performance of the Kinetic Energy Interceptor booster

FY09 Planned Program:

RDT&E Articles: Booster Flight Two - First and Second stage motors with mock payload (1); Partial Full Scale - Interceptor flight with mock payload (1).

- Conduct Stage 1 design update rocket motor static firing
- Conduct Stage 2 design update rocket motor static firing
- Begin fabrication and test of Booster Flight Two (FTK-02) hardware

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification	Date: February 2007
APPROPRIATION/BUDGET ACTIVITY: RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)	R-1 NOMENCLATURE: 0603886C Ballistic Missile Defense System Interceptors

	FY 2006	FY 2007	FY 2008	FY 2009
Element Engineering	0	0	62,968	84,460
RDT&E Articles (Quantity)	0	0	0	0

The Kinetic Energy Interceptors element engineering activities include all prime contractor program management operations, capability and interface specification development and flow-down, operations concept definition, element-level design trades, engagement sequence definition, element analyses and performance assessments, target of opportunity analysis to reduce key program risks such as tracking and discrimination, configuration control and change management, manufacturing, quality, affordability and risk-reduction, simulation development, and collaborative engineering planning and management with the Kinetic Energy Interceptor integrated product teams and key Agency organizations (Systems Engineering, Sensors, and Command, Control, Battle Management and Communications). The near term focus of element engineering is a cost effective, high mission assurance land-fixed interceptor capability. Element engineering for a mobile interceptor capability will occur in parallel to the degree necessary to ensure the land-fixed interceptor is compatible with planned mobile launcher and fire control and communications components. Integration and Test work in support of development and integrated flight tests is also part of element engineering.

FY08 Planned Program:

- Conduct Weapon Element System Requirements Review to establish payload, common booster, land-fixed element, and mobile element requirements
- Support payload System Requirements Reviews to establish detailed payload requirements
- Update element capability and interface specifications
- Allocate functional requirements to mobile launcher and fire control components
- Generate top level (A-level) design specification and flow-down to the interceptor product team
- Update Developmental Master Test Plan
- Complete preliminary requirements analysis and design of System Integration Lab, System Integration Facility, and Element Integration Facility
- Complete detailed requirements analysis and design for Phase I of the Element Integration Facility to support initial land-fixed capability flight tests

FY09 Planned Program:

- Complete Kinetic Energy Interceptors Test Bed Description Document, system specification, and element capability and interface specifications
- Deliver Kinetic Energy Interceptors Simulation version 3.0
- Initiate development and construction (architecture and engineering contracts) for Phase I of the Element Integration Facility to prepare for land-fixed site capability flight tests

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification	Date: February 2007
APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE: **0603886C Ballistic Missile Defense System Interceptors**

- Update Developmental Master Test Plan
- Initiate long-lead range resource and safety and environmental planning and coordination for Booster Flight Two (FTK-02), Partial Full Scale (FTK-03), and Control Test Vehicle (FTK-04) flight tests

	FY 2006	FY 2007	FY 2008	FY 2009
Government Systems Engineering and Program Management	0	0	20,090	33,677
RDT&E Articles (Quantity)	0	0	0	0

The Government Systems Engineering and Program Management effort includes the program office, service laboratory and intelligence agency generation of threat data packages for the Kinetic Energy Interceptors development and test contract, BMDS interface definition and implementation support outside the Kinetic Energy Interceptor program office, participation in ballistic missile defense wargames, off-contract technology risk reduction efforts, and off-contract special studies such as congressional reports and the sea-based platform alternatives assessment.

The Kinetic Energy Interceptor is designed as a multi-use land/sea all-up round. The interceptor dimensions and safety features such as a gas eject launch make it compatible with surface combatants, submarines, and large non-combatant ships. In FY 2005 we completed a joint study with the Navy on the concept of operations and feasibility of the sea-mobile multi-use mission. In FY 2006 and FY 2007 we will complete a joint KEI Sea-Mobile Platform Alternatives Assessment to decide on a KEI sea-mobile platform strategy which will allow us to begin platform-specific planning, system engineering, and risk reduction to facilitate a smooth start on future sea-mobile development and test after the FY 2008 decision point.

The Government Integration and Test work for test range planning and event support and environmental compliance are included under Government Systems Engineering and Program Management.

FY08 Planned Program:

- Update Kinetic Energy Interceptors sections of BMDS Test Bed Description Document and System Specification in collaboration with MDA Systems Engineering team
- Participate in Nimble Titan and Joint Project Optic Windmill Wargames
- Analyze relevant Targets of Opportunity test data and incorporate results into Kinetic Energy Interceptors simulations and engineering notebooks
- Perform detailed range resource and safety planning and coordination for Booster Flight One (FTK-01)

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification	Date: February 2007
APPROPRIATION/BUDGET ACTIVITY: RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)	R-1 NOMENCLATURE: 0603886C Ballistic Missile Defense System Interceptors

FY09 Planned Program:

- Update Kinetic Energy Interceptors sections of BMDS Test Bed Description Document and System Specification in collaboration with MDA Systems Engineering team
- Participate in Nimble Titan Wargame
- Analyze relevant Targets of Opportunity test data and incorporate results into Kinetic Energy Interceptors simulations and engineering notebooks

C. Other Program Funding Summary

	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	Total Cost
PE 0603175C Ballistic Missile Defense Technology	147,270	193,307	118,569	109,540	116,014	121,008	127,917	131,291	1,064,916
PE 0603881C Ballistic Missile Defense Terminal Defense Segment	1,120,879	1,092,076	962,585	1,004,282	924,101	851,213	678,694	501,147	7,134,977
PE 0603882C Ballistic Missile Defense Midcourse Defense Segment	2,391,246	3,043,058	2,520,064	2,359,665	2,179,602	1,699,963	1,153,082	1,183,003	16,529,683
PE 0603883C Ballistic Missile Defense Boost Defense Segment	455,572	628,958	548,759	432,432	448,375	678,913	829,683	1,026,239	5,048,931
PE 0603884C Ballistic Missile Defense Sensors	284,297	514,129	778,163	984,963	939,417	791,701	723,843	603,585	5,620,098
PE 0603888C Ballistic Missile Defense Test and Targets	610,619	601,782	586,150	628,364	662,984	681,511	696,037	705,210	5,172,657
PE 0603889C Ballistic Missile Defense Products	387,402	0	0	0	0	0	0	0	387,402
PE 0603890C Ballistic Missile Defense System Core	409,993	429,420	482,016	511,147	558,746	579,571	579,316	588,481	4,138,690
PE 0603891C Special Programs - MDA	271,021	353,031	323,250	305,409	369,073	526,966	789,017	792,271	3,730,038
PE 0603892C Ballistic Missile Defense Aegis	893,040	1,122,669	1,059,103	1,129,425	1,221,650	1,067,587	1,054,753	1,089,078	8,637,305
PE 0603893C Space Tracking & Surveillance System	220,048	322,220	331,525	347,811	412,623	501,197	778,067	981,424	3,894,915
PE 0603894C Multiple Kill Vehicle	48,370	144,362	271,151	352,741	461,179	618,263	673,477	842,905	3,412,448
PE 0603895C BMD System Space Program	0	0	27,666	35,093	46,849	56,183	133,617	157,117	456,525
PE 0603896C BMD C2BMC	0	246,852	258,913	294,627	300,847	282,615	267,275	269,420	1,920,549
PE 0603897C BMD Hercules	0	49,674	53,658	54,264	54,405	55,142	53,355	54,198	374,696
PE 0603898C BMD Joint Warfighter Support	0	54,935	48,787	50,428	54,086	56,603	58,890	60,206	383,935
PE 0603904C BMD Joint National Integration Center (JNIC)	0	110,629	104,012	106,985	111,542	111,947	113,592	115,287	773,994
PE 0603905C BMD Concurrent Test and Operations	0	23,159	0	0	0	0	0	0	23,159
PE 0603906C Regarding Trench	0	0	2,000	3,000	5,000	5,000	9,000	9,000	33,000
PE 0605502C Small Business Innovative Research - MDA	133,105	0	0	0	0	0	0	0	133,105

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification	Date: February 2007
APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE: **0603886C Ballistic Missile Defense System Interceptors**

	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	Total Cost
PE 0901585C Pentagon Reservation	14,874	15,527	6,058	6,376	4,490	4,725	4,801	4,877	61,728
PE 0901598C Management Headquarters - MDA	98,609	87,059	85,906	86,453	70,355	69,855	69,855	69,855	637,947

D. Acquisition Strategy

The Kinetic Energy Interceptors development and test acquisition strategy focuses on developing gap-filling, multi-use kinetic energy capabilities for land-fixed and strategically deployable land-mobile and sea-mobile platforms. The Kinetic Energy Interceptor element is being developed under a single prime contractor selected competitively at the start of development. As of this budget, the revised acquisition strategy for Kinetic Energy Interceptors is for payloads to be budgeted and developed under other BMDS elements that deliver each payload for integration into the Kinetic Energy Interceptors element. Also, initial testing and deployment of the Kinetic Energy Interceptor booster will now be from a land-fixed site to leverage available BMDS infrastructure. The FY 2005 through FY 2008 development verification test results mitigate critical program risks, and provide the agency very detailed design, performance, cost, and programmatic knowledge to support the FY 2008 knowledge point decision. This strategy also implements early proofing of critical manufacturing processes as an integral part of the design process. The payoff for these up front program investments in systems engineering, full scale risk reduction testing, and manufacturing process development is reduced redesign and retest, fewer test failures as well as lowered manufacturing cost. The strategy will utilize Engineering and Manufacturing Readiness Levels and Software Readiness Levels as maturity and risk indicators for proceeding forward with detailed design, building flight hardware and having a production off-ramp.

Missile Defense Agency (MDA) Exhibit R-3 RDT&E Project Cost Analysis	Date: February 2007
APPROPRIATION/BUDGET ACTIVITY: RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)	R-1 NOMENCLATURE: 0603886C Ballistic Missile Defense System Interceptors

I. Product Development Cost ($ in Thousands)

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2007 Cost	FY 2007 Award/ Oblg Date	FY 2008 Cost	FY 2008 Award/ Oblg Date	FY 2009 Cost	FY 2009 Award/ Oblg Date	Total Cost
Interceptor										
Interceptor	C/CPAF	Raytheon, Tucson, AZ	0	0	N/A	130,970	1/2Q	252,836	1/2Q	383,806
Element Engineering										
Contractor Element Engineering	C/CPAF	Northrop Grumman, Fairfax, VA	0	0	N/A	62,968	1/2Q	84,460	1/2Q	147,428
Government Systems Engineering and Program Management										
Subtotal Product Development			0	0		193,938		337,296		531,234

Remarks

II. Support Costs Cost ($ in Thousands)

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2007 Cost	FY 2007 Award/ Oblg Date	FY 2008 Cost	FY 2008 Award/ Oblg Date	FY 2009 Cost	FY 2009 Award/ Oblg Date	Total Cost
Interceptor										
Element Engineering										
Government Systems Engineering and Program Management										
Civilian Salaries		Missile Defense Agency, Huntsville, AL	0	0	4Q	3,023	N/A	3,139	N/A	6,162
Government Travel		Missile Defense Agency, Huntsville, AL	0	0	4Q	646	N/A	662	N/A	1,308

Missile Defense Agency (MDA) Exhibit R-3 RDT&E Project Cost Analysis	Date: February 2007
APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE: **0603886C Ballistic Missile Defense System Interceptors**

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2007 Cost	FY 2007 Award/ Oblg Date	FY 2008 Cost	FY 2008 Award/ Oblg Date	FY 2009 Cost	FY 2009 Award/ Oblg Date	Total Cost
SETA	C/FFP	MEI, Huntsville, AL	0	0	4Q	10,727	1/3Q	11,361	1/3Q	22,088
FFRDC	FFRDC	MITRE Corp, McLean, VA	0	0	4Q	381	1Q	404	1Q	785
KEI BMDS Interfaces	C/CPAF	Northrop Grumman, Fairfax, VA	0	0	4Q	4,993	1/2Q	16,785	1/2Q	21,778
NEPA	MIPR	SMDC, Huntsville, AL	0	0	N/A	215	1/2Q	180	1/2Q	395
GFE	Various	Northrop Grumman, Fairfax, VA	0	0	N/A	105	1/2Q	1,146	1/2Q	1,251
Subtotal Support Costs			0	0		20,090		33,677		53,767

Remarks

III. Test and Evaluation Cost ($ in Thousands)

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2007 Cost	FY 2007 Award/ Oblg Date	FY 2008 Cost	FY 2008 Award/ Oblg Date	FY 2009 Cost	FY 2009 Award/ Oblg Date	Total Cost
Interceptor										
Element Engineering										
Government Systems Engineering and Program Management										
Subtotal Test and Evaluation			0	0		0		0		0

Remarks

Missile Defense Agency (MDA) Exhibit R-3 RDT&E Project Cost Analysis	Date: February 2007
APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE: **0603886C Ballistic Missile Defense System Interceptors**

IV. Management Services Cost ($ in Thousands)

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2007 Cost	FY 2007 Award/ Oblg Date	FY 2008 Cost	FY 2008 Award/ Oblg Date	FY 2009 Cost	FY 2009 Award/ Oblg Date	Total Cost
Interceptor										
Element Engineering										
Government Systems Engineering and Program Management										
Subtotal Management Services			0	0		0		0		0

Remarks

Project Total Cost			0	0		214,028		370,973		585,001

Remarks

The Prime Contractor has the responsibility to balance resources across the Kinetic Energy Interceptors program and allocate funding according to program progress. This may require the Prime Contractor to reallocate funding, which would change the estimates provided in this R-3 document.

Missile Defense Agency (MDA) Exhibit R-4 Schedule Profile

Date: **February 2007**

APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**

R-1 NOMENCLATURE: **0603886C Ballistic Missile Defense System Interceptors**

Fiscal Year	2006				2007				2008				2009				2010				2011				2012				2013			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Kinetic Energy Interceptors Knowledge Point Events																																
Booster Flight One Test (FTK-01)												△																				
Interceptor																																
Conduct Booster Flight #2 (FTK-02)																						△										
Conduct Partial Full Scale (PFS) Test 3 (FTK-03)																										△						
Interceptor Component System Requirements Review									△																							
Stage 2 Rocket Motor Static Fire Two									△																							
Stage 1 Rocket Motor Static Fire Three										△																						
Stage 1 Rocket Motor Static Fire Four											△																					
Stage 2 Rocket Motor Static Fire Three											△																					
Booster Flight One Test (FTK-01)												△																				
Stage 2 Rocket Motor Static Fire Four												△																				
Stage 1 Rocket Motor Static Fire Five																△																

Legend

▲	Significant Event (complete)	△	Significant Event (planned)
★	Milestone Decision (complete)	☆	Milestone Decision (planned)
◆	Element Test (complete)	◇	Element Test (planned)
▼	System Level Test (complete)	▽	System Level Test (planned)
▲▲	Complete Activity	△△	Planned Activity

Missile Defense Agency (MDA) Exhibit R-4 Schedule Profile	Date: February 2007
APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE: **0603886C Ballistic Missile Defense System Interceptors**

Fiscal Year	2006				2007				2008				2009				2010				2011				2012				2013			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Interceptor																																
Stage 2 Rocket Motor Static Fire Five																Δ																
Interceptor Component Design Review - 0																	Δ															
Stage 1 Rocket Motor Static Fire Six																	Δ															
Stage 2 Rocket Motor Static Fire Six																	Δ															
1st Booster Pre-Flight Qualification Static Firing																						Δ										
Interceptor Component Design Review - 1																						Δ										
2nd Pre-Flight Qualification Static Firing																							Δ									
1st Booster Qualification Static Fire																										Δ						
2nd Flight Qualification Static Fire																											Δ					
3rd Flight Qualification Static Fire																												Δ				
Interceptor Component Design Review - 2																													Δ			
Deliver Integrated Flight Test Articles and Spare																														Δ	Δ	Δ

Legend

Significant Event (complete)	Significant Event (planned)
Milestone Decision (complete)	Milestone Decision (planned)
Element Test (complete)	Element Test (planned)
System Level Test (complete)	System Level Test (planned)
Complete Activity	Planned Activity

Missile Defense Agency (MDA) Exhibit R-4 Schedule Profile

Date: **February 2007**

APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**

R-1 NOMENCLATURE: **0603886C Ballistic Missile Defense System Interceptors**

Fiscal Year	2006				2007				2008				2009				2010				2011				2012				2013			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Element Engineering																																
Weapon Element System Requirements Review									Δ																							
Complete KEI section of BMDS TBDD and TBSS										Δ																						
Conduct Capability Design Review - 0																	Δ															
Complete System Integration Lab facility																		Δ														
Complete Element Integration Facility Phase I																					Δ											
Conduct Land-Fixed Capability Design Review - 1																						Δ										
Conduct Land-Fixed Capability Design Review - 2																												Δ				
Conduct Control Test Vehicle Flight Test (FTK-04)																													Δ			

Legend

▲	Significant Event (complete)	△	Significant Event (planned)
★	Milestone Decision (complete)	☆	Milestone Decision (planned)
◆	Element Test (complete)	◇	Element Test (planned)
▼	System Level Test (complete)	▽	System Level Test (planned)
▲▲	Complete Activity	△△	Planned Activity

Missile Defense Agency (MDA) Exhibit R-4A Schedule Detail	Date: February 2007
APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE: **0603886C Ballistic Missile Defense System Interceptors**

Schedule Profile	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
Kinetic Energy Interceptors Knowledge Point Events								
Booster Flight One Test (FTK-01)			4Q					
Interceptor								
Conduct Booster Flight #2 (FTK-02)						2Q		
Conduct Partial Full Scale (PFS) Test 3 (FTK-03)							1Q	
Interceptor Component System Requirements Review			1Q					
Stage 2 Rocket Motor Static Fire Two			1Q					
Stage 1 Rocket Motor Static Fire Three			2Q					
Deliver Booster Flight One (FTK-01) components			3Q					
Stage 1 Rocket Motor Static Fire Four			3Q					
Stage 2 Rocket Motor Static Fire Three			3Q					
Booster Flight One Test (FTK-01)			4Q					
Stage 2 Rocket Motor Static Fire Four			4Q					
Stage 1 Rocket Motor Static Fire Five				4Q				
Stage 2 Rocket Motor Static Fire Five				4Q				
Interceptor Component Design Review - 0					1Q			
Stage 1 Rocket Motor Static Fire Six					1Q			
Stage 2 Rocket Motor Static Fire Six					1Q			
1st Booster Pre-Flight Qualification Static Firing						2Q		
Booster Flight #2 Article Delivered						2Q		
Interceptor Component Design Review - 1						2Q		
2nd Pre-Flight Qualification Static Firing						3Q		
1st Booster Qualification Static Fire							1Q	
2nd Flight Qualification Static Fire							2Q	
3rd Flight Qualification Static Fire							3Q	
Deliver Control Test Vehicle (CTV) Article							4Q	
Interceptor Component Design Review - 2							4Q	
Deliver Integrated Flight Test Articles and Spare								2Q,3Q,4Q
Element Engineering								
Deliver KEI SIM Version 3.0			1Q					

Missile Defense Agency (MDA) Exhibit R-4A Schedule Detail	Date: February 2007
APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE: **0603886C Ballistic Missile Defense System Interceptors**

Schedule Profile	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
Weapon Element System Requirements Review			1Q					
Complete KEI section of BMDS TBDD and TBSS			2Q					
Support Payload System Requirements Reviews			2Q,3Q					
Publish/Update VV&A Plan			3Q	3Q	3Q	3Q		
Target of Opportunity Data Analysis			3Q	3Q	3Q	3Q	3Q	3Q
Publish/Update Development Master Test Plan			4Q	4Q	4Q	4Q		
Conduct Capability Design Review - 0					1Q			
Complete System Integration Lab facility					2Q			
Complete Element Integration Facility Phase I						1Q		
Conduct Land-Fixed Capability Design Review - 1						2Q		
Conduct Land-Fixed Capability Design Review - 2							4Q	
Conduct Control Test Vehicle Flight Test (FTK-04)								1Q
Participate in Nimble Titan Wargame Exercise			3Q	3Q	3Q	3Q	3Q	3Q

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification	Date: February 2007
APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE: **0603886C Ballistic Missile Defense System Interceptors**

COST ($ in Thousands)	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
0602 Program-Wide Support	10,482	19,208	13,471	22,344	35,440	36,557	38,350	29,527
RDT&E Articles Qty	0	0	0	0	0	0	0	0

A. Mission Description and Budget Item Justification

Program-Wide Support provides funding for common non-headquarters support functions across the entire program such as strategic planning, program integration, business management, cost estimating, contracting, and financial management, to include preparation of financial statements, reimbursement of financial services provided by DFAS, internal review and audit, earned-value management, and program assessment. Includes costs for both government civilians performing these functions, as well as outside services and support contractors that augment government staff in these areas. Many of these costs reside within the Missile Defense Agency Executing Agents in the Services: Army Space and Missile Defense Command, Army PEO Space and Missile Defense, Office of Naval Research, and various Air Force laboratory and acquisition activities, although some functions and costs within this program element are performed by MDA employees assigned within the National Capital Region (NCR). Other costs included herein provide facility capabilities for MDA Executing Agent locations, such as physical and technical security, legal services, travel and training, office and equipment leases, utilities and communications, supplies and maintenance, and similar operating expenses. Also includes funding for charges on canceled appropriations in accordance with Public Law 101-510, legal settlements, and foreign currency fluctuation on a limited number of foreign contracts.

B. Accomplishments/Planned Program

	FY 2006	FY 2007	FY 2008	FY 2009
Civilian Salaries and Support	10,482	19,208	13,471	22,344
RDT&E Articles (Quantity)	0	0	0	0

See Section A: Mission Description and Budget Item Justification

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification	Date: February 2007
APPROPRIATION/BUDGET ACTIVITY: RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)	R-1 NOMENCLATURE: 0603886C Ballistic Missile Defense System Interceptors

C. Other Program Funding Summary

	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	Total Cost
PE 0603175C Ballistic Missile Defense Technology	147,270	193,307	118,569	109,540	116,014	121,008	127,917	131,291	1,064,916
PE 0603881C Ballistic Missile Defense Terminal Defense Segment	1,120,879	1,092,076	962,585	1,004,282	924,101	851,213	678,694	501,147	7,134,977
PE 0603882C Ballistic Missile Defense Midcourse Defense Segment	2,391,246	3,043,058	2,520,064	2,359,665	2,179,602	1,699,963	1,153,082	1,183,003	16,529,683
PE 0603883C Ballistic Missile Defense Boost Defense Segment	455,572	628,958	548,759	432,432	448,375	678,913	829,683	1,026,239	5,048,931
PE 0603884C Ballistic Missile Defense Sensors	284,297	514,129	778,163	984,963	939,417	791,701	723,843	603,585	5,620,098
PE 0603888C Ballistic Missile Defense Test and Targets	610,619	601,782	586,150	628,364	662,984	681,511	696,037	705,210	5,172,657
PE 0603889C Ballistic Missile Defense Products	387,402	0	0	0	0	0	0	0	387,402
PE 0603890C Ballistic Missile Defense System Core	409,993	429,420	482,016	511,147	558,746	579,571	579,316	588,481	4,138,690
PE 0603891C Special Programs - MDA	271,021	353,031	323,250	305,409	369,073	526,966	789,017	792,271	3,730,038
PE 0603892C Ballistic Missile Defense Aegis	893,040	1,122,669	1,059,103	1,129,425	1,221,650	1,067,587	1,054,753	1,089,078	8,637,305
PE 0603893C Space Tracking & Surveillance System	220,048	322,220	331,525	347,811	412,623	501,197	778,067	981,424	3,894,915
PE 0603894C Multiple Kill Vehicle	48,370	144,362	271,151	352,741	461,179	618,263	673,477	842,905	3,412,448
PE 0603895C BMD System Space Program	0	0	27,666	35,093	46,849	56,183	133,617	157,117	456,525
PE 0603896C BMD C2BMC	0	246,852	258,913	294,627	300,847	282,615	267,275	269,420	1,920,549
PE 0603897C BMD Hercules	0	49,674	53,658	54,264	54,405	55,142	53,355	54,198	374,696
PE 0603898C BMD Joint Warfighter Support	0	54,935	48,787	50,428	54,086	56,603	58,890	60,206	383,935
PE 0603904C BMD Joint National Integration Center (JNIC)	0	110,629	104,012	106,985	111,542	111,947	113,592	115,287	773,994
PE 0603905C BMD Concurrent Test and Operations	0	23,159	0	0	0	0	0	0	23,159
PE 0603906C Regarding Trench	0	0	2,000	3,000	5,000	5,000	9,000	9,000	33,000
PE 0605502C Small Business Innovative Research - MDA	133,105	0	0	0	0	0	0	0	133,105
PE 0901585C Pentagon Reservation	14,874	15,527	6,058	6,376	4,490	4,725	4,801	4,877	61,728
PE 0901598C Management Headquarters - MDA	98,609	87,059	85,906	86,453	70,355	69,855	69,855	69,855	637,947